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GEOCHEMISTRY.—*Vanadium and chromium in rutile and the possible effect of vanadium on color.* THOMAS L. WATSON, University of Virginia. Communicated by F. W. Clarke.

Vanadium and chromium are rather widely diffused in very small quantity in a variety[1] of rocks and minerals, especially in igneous rocks. Clarke[2] computes the average of 87 determinations of V_2O_3 in igneous rocks analyzed in the laboratory of the U. S. Geological Survey to be 0.013 per cent, and for 256 igneous rocks 0.05 per cent of Cr_2O_3. In addition to its general presence in small amount in igneous rocks (shown by Hillebrand[3] to be smallest in persilicic rocks and highest in subsilicic rocks), vanadium occurs in many sedimentary and metamorphic rocks and in a variety of minerals.[4] It occurs in some hydrocarbons especially asphaltite from Peru and elsewhere[5] and in some coals (lignite and anthracite), and has been reported in some meteorites, in the

[1] A good summary of the reported distribution of vanadium in rocks and minerals with references is given by Clarke, F. W., Bull. U. S. Geol. Survey, No. 491, 672–678. 1912. See also Moissan, H., Traité de Chimie Mineralogie, **2**: 100. 1905; and Thorpe's Dictionary of Applied Chemistry, 1909; Vogt, J. H. L., Zeitschr. prakt. Geol., p. 274. 1899. For the distribution of chromium see Bull. U. S. Geol. Survey, No. 491, 664–666. 1912.

[2] Clarke, F. W., Loc. cit.

[3] Hillebrand, W. F., Amer. Jour. Sci. **6**: 209–216. 1898; also see Bull. U. S. Geol. Survey, No. 167, 49–55. 1900.

[4] Hayes, H. H., Proc. Amer. Acad. **10**: 294. 1875.

[5] Hewitt, D. F., Vanadium Deposits in Peru, Trans. A. I. M. E. **40**: 274–299. 1910.

ash of some plants, and in some natural waters. From available data it seems probable that chromium is more widely diffused than vanadium, Clarke's estimate in 1900 for the lithosphere being 0.01 per cent. It is common in some meteorites, but is most important in subsilicic rocks like peridotites and the serpentines derived from them, present in the form of the magmatic mineral chromite.

Both vanadium and chromium are not uncommon constituents in heavy ferric silicate minerals, such as some pyroxenes, amphiboles, and dark micas (biotite).[6] They have long been known in titaniferous magnetites.[7]

Altho vanadium was reported in rutile from St. Yrieux[8] in 1859 and chromium in a Swedish rutile from Käringbricka[9] as early as 1803, their presence in analyses of rutile and ilmenite are rarely indicated. Examination of the available analyses of rutile shows that with but few exceptions the oxides of titanium and iron, the latter usually reported as ferrous oxide, are the only constituents present. These to be sure are the chief constituents, but in light of recent investigations of rutile from various localities in the United States and Europe, vanadium is quite constantly present in variable small quantity, and in a majority of them chromium is also found.

By methods of spectrum analysis Hasselberg[10] in 1897 reported the presence of vanadium in 12 rutiles from localities in the United States, Spain, Germany, France, Switzerland, Russia, Norway, and Sweden. Vanadium was not detected in anatase from Switzerland. Hasselberg also reported the presence of chromium in 10 of the 12 rutiles examined, it being absent in anatase from Switzerland and Magnet Cove, Arkansas. It is a noteworthy fact that of the 22 analyses of rutile quoted by Hintze[11] neither

[6] Hillebrand, W. F., Loc. cit.

[7] Walz, Isidor, Amer. Chemist, **6**: 453–456. 1876; Kemp, J. F., 19th Ann. Rept. U. S. Geol. Survey, Pt. III, 387–397. 1897–98.

[8] Deville, H., Sainte-Claire, Comp. Rend., **49**: 301. 1859.

[9] Dana, E. S., A System of Mineralogy, p. 239. 1900.

[10] Hasselberg, B., Astrophysical Journal **6**: 22–26. 1897. Also Chem. News, **76**: 102–104. 1897; see also Giles, W. B., Chem. News, **67**: 137. 1897.

[11] Hintze, C., Handbuch der Mineralogie, p. 1622. 1907.

vanadium nor chromium is reported as being present in a single analysis. Of 100 analyses of ilmenites quoted by Hintze[12] Cr_2O_3, ranging from a trace to 0.56 per cent, is reported in 8, and vanadium is not listed in any.

In recent investigations of rutile by the Virginia Geological Survey accurate chemical analyses of several rutiles and ilmenite were made, and each analysis agreed in showing the presence of both vanadium and chromium in small and unequal but appreciable amounts. The results follow in the annexed tabular statement.

Partial chemical analyses of rutile and ilmenite

(Wm. M. Thornton, Jr., analyst)

	I	II	III	IV
V_2O_3	0.15	0.20	0.55	0.24
Cr_2O_3	0.02	0.07	0.39	0.07
FeO	2.35	1.68	0.81	

I. Red rutile from feldspathic facies of syenite, Roseland, Nelson County, Virginia.

II. Very dark rutile from nelsonite on Warwick tract, 1½ miles northwest of Rose's Mill, Nelson County, Virginia.

III. Nearly black rutile from Krageroe, Norway.

IV. Black ilmenite from same locality as II.

Attention is directed in the analyses to the predominance of vanadium over chromium. Hasselberg[13] found for the rutiles he examined that when vanadium was present in very appreciable amount chromium was also present, but when vanadium was present in very small amount chromium was present either in trace or entirely absent. Altho there are frequent exceptions vanadium is commonly tho but slightly in excess of chromium in the known analyses of titaniferous magnetites. The exact form or combination in which these two constituents are present in rutile is entirely conjectural. As Washington[14] remarks vanadium probably exists as V_2O_3, replacing Al_2O_3 and Fe_2O_3, in ferro-

[12] Hintze, C., Ibid., pp. 1876–1881. 1908.

[13] Hasselberg, B., Op. cit.

[14] Washington, H. S., Trans. A. I. M. E. **39**: 756. 1909.

magnesian silicate minerals, since it is essentially absent from such rocks as peridotites of which olivine is the chief mineral and the iron is ferrous oxide. It seems probable as has been suggested by Kemp[15] that V_2O_3 may be present in titaniferous magnetites replacing some of the ferric oxide, and he has remarked on the extremely sympathetic relations of Cr_2O_3 and V_2O_3 in the same ores.[16]

A second fact which at least is suggestive is that the chemical analyses of rutiles that have been made under the direction of the writer indicate that difference in depth of color is probably not to be attributed to iron oxide. On comparing the percentages of iron (FeO) with those of vanadium (V_2O_3) in the table above it will be observed that vanadium increases with decrease of iron, and the color increases in depth in the same direction. In other words the rutile (I) containing highest FeO and lowest V_2O_3 is red in color, while the rutile (III) showing lowest FeO and highest V_2O_3 is nearly black; II is intermediate in color and shows less FeO and more V_2O_3 than I.

No conclusions of course can be drawn for rutiles in general since complete analyses of the mineral are exceedingly few, but the above results are suggestive and it will be of interest to ascertain whether the possible relation holds in future analyses of rutile. Sufficient work has been accomplished by recent students, however, to indicate that in future analyses of rutiles careful search should be made for both vanadium and chromium.

BOTANY.—*Pomegranate flowers dimorphic.* O. F. Cook, Bureau of Plant Industry, U. S. Department of Agriculture.

The flowers of the pomegranate are of two forms that can be distinguished by the shape of the buds long before the time of opening. The buds that are to produce perfect flowers and set fruit appear more cylindrical than the others, because they have a larger base and are usually more abruptly rounded below. The other buds are shorter, with a narrower and more tapering base, and a general shape that may be described as obconic or turbinate.

[15] Kemp, J. F., Trans. A. I. M. E., **40**: 862. 1910.

[16] Kemp, J. F., 19th Ann. Rept. U. S. Geol. Survey, Pt. III, p. 396. 1897–98.

Such flowers do not set fruit, but soon fall off. In most cases it is very easy to assign a bud to the right class after the distinction has once been noticed.

Fig. 1. Pomegranate buds and flower, bisexual fruit-producing form (natural size).

Buds of the longer, more cylindrical form, shown in figure 1, produce perfect flowers, with well-developed, functional ovaries.

Fig. 2. Pomegranate buds and flower, staminate form, not producing fruit (natural size).

In such flowers the style is long and the stigma is carried out beyond the mass of stamens. This makes it possible for the stigma to be exposed as soon as the calyx opens, and while the stamens

are still completely covered by the infolded petals, an arrangement obviously favorable to cross-fertilization.

In the other type of flowers, with the narrow tapering base, shown in figure 2, the ovaries are poorly developed and have only minute rudimentary ovules that degenerate and shrivel, sometimes even before the flowers open, leaving the ovarial chambers apparently empty. A corresponding reduction appears in the styles, which are often less than half as long as in the perfect flowers and remain hidden under the stamens. This arrangement might be considered as favorable for self-fertilization, were it not that the short-styled flowers have lost all but the staminal functions, as shown by the reduced ovaries and abortive ovules. In the staminate flowers the whole surface of the ovary becomes bright red like the upper part of the calyx tube, but the perfect flowers often fail to show the bright color on the ovary.

The second or staminate form of flowers was much more numerous on most of the bushes and some of them had none of the perfect flowers, so that no fruit could be set. Thus the pomegranate may be considered as a polygamodioecious plant, to the extent that a large proportion of the flowers no longer produce functional pistils. On the other hand, the perfect flowers show no apparent tendency to lose the staminal function. It is as tho a simple dimorphism of short and long styles had been followed by a further reduction of the pistils and ovules of the shortstyled flowers, until the reproductive functions were lost.

The existence of ornamental varieties of the pomegranate that produce no fruits, but are propagated entirely from cuttings, may be taken to indicate a further dioecious tendency. In varieties that have double flowers sterility might be due to loss of function in the stamens, but it now appears that absence of perfect flowers with functional pistils may be another cause of unfruitfulness. At Bard, California, where these observations were made, several of the bushes with ordinary single corollas had only the staminate form of flowers and buds. But as this might not be true in another season, the extent of the dioecious tendency remains in doubt. The bushes were flowering abundantly at the middle of May, 1912, and the beauty of the floral display

attracted attention. A large series of seedlings is being raised at Bard for breeding purposes, under the direction of Mr. Thomas H. Kearney of the United States Department of Agriculture. The fact that the fruit-bearing possibilities of the buds could be determined before the flowers opened was noticed by Mr. G. B. Gilbert, and this led to a more detailed examination.

Tho it seems quite improbable that such a specialization should not have been described before, the existence of two forms of flowers in the pomegranate is not recognized in the chief works of reference. Knuth's *Handbook of Flower Pollination* describes the flowers of Punica as "homogamous or protandrous," which would be true of only the sterile or staminate flowers. On the authority of Schultz it is stated that "The style is very short, and may be either receptive during the dehiscence of the anthers or become so after their pollen is shed. Autogamy by means of pollen that remains in the flower is possible in both cases." Such a statement might be made if the observations were limited to an ornamental variety of the pomegranate that did not produce perfect flowers. The same limitation might be inferred from a statement by Niedenzu, in Engler and Prantl's *Natürlichen Pflanzen-Familien*, that the ovary is often abortive.

The bearing of the dioecious tendency upon the problem of breeding fruiting varieties of pomegranates is obvious. Failure to produce a sufficient number of the fertile flowers would render a variety unproductive, tho it might blossom abundantly. On the other hand, the possibility that some varieties require cross-fertilization should receive consideration.

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the editors. Each of the scientific bureaus in Washington has a representative authorized to forward such material to this journal and abstracts of official publications should be transmitted through the representative of the bureau in which they originate. The abstracts should conform in length and general style to those appearing in this issue.

CHEMISTRY.—*Sodium oxalate as a standard in volumetric analysis.* Circular No. 40, Bureau of Standards. 1912.

This circular gives a resumé of the work done on sodium oxalate at the Bureau of Standards and elsewhere, which has led to its selection by this Bureau as a primary standard, which is now issued in a form similar to other standard analyzed samples. The methods of preparation, testing and use of sodium oxalate are described and discussed. This salt is recommended especially as an oxidimetric standard, tho directions for its use in acidimetry are also given. W. BLUM.

GEOLOGY.—*The Alatna-Noatak region, Alaska.* PHILIP S. SMITH. Bulletin U. S. Geological Survey No. 520 L. Pp. 26, with map. 1912.

The Alatna-Noatak region in northwestern Alaska receives its name from the two streams, the Alatna, which flows southward into the Koyukuk and thence into the Yukon, and the Noatak, which flows westward into Kotzebue Sound north of the Arctic Circle. Valley glaciers occur in the basins of both streams.

The geologic sequence from the base up is as follows: (1) Highly metamorphic schists of early Paleozoic age; (2) unconformably overlying them, intensely deformed limestones of undetermined age, in part probably Carboniferous, (3) a considerable thickness of complexly folded and faulted Mississippian sandstones, quartzites, and thin limestones containing molluscan remains; (4) a group of massive limestones overlying the sandstones and correlated with the Lisburne limestone of Mississippian age; (5) float of a cherty limestone containing Upper Triassic fossils; (6) Upper Cretaceous sandstones and conglomerates; and (7) unconsolidated deposits of marine, glacial, and fluviatile origin

ranging in age from Pleistocene to Recent. The igneous rocks are greenstones, intruding the metamorphic schists; gabbros, in stocks and dikes cutting the Mississippian sandstones; and granites, cutting the limestones of undetermined age in the upper part of the Alatna basin.

Many of the more striking present-day topographic features were produced by the agency of valley glaciers in the recent past.

Mineralization is confined mainly to the schists and pre-Mississippian rocks and is apparently not related to the igneous intrusives. There is no mining in the region, tho gold has been found in the gravels in the central part of the Alatna valley and in the headward portion of the Noatak, and veins of copper and gold have been reported in the same general region. P. S. S.

GEOLOGY.—*Reconnaissance of the Jarbidge, Contact and Elk Mountain districts, Nevada.* F. C. SCHRADER. Bulletin U. S. Geological Survey No. 497. Pp. 162, with maps, sections, and illustrations. 1912.

The districts described are in Elko County in northeastern Nevada, in a region occupied chiefly by Paleozoic sedimentary rocks, probably Carboniferous. These rocks, comprising quartzite, limestone, shale and slate, are folded and faulted and are intruded by Cretaceous (?) granodiorite. This series is capped by Tertiary eruptives, principally rhyolite, overlain by Tertiary lake beds and Quaternary deposits.

In the Jarbidge district the rocks are principally rhyolite flows with some Paleozoic sediments. The flows are separable into an older or Miocene (?) group and a younger or Pliocene group.

The principal rocks of the Contact district are granodiorite and the Paleozoic sediments which it intrudes. The granodiorite is surrounded by overlying, outward-dipping Paleozoic sediments with a known thickness of about 1600 feet. They are metamorphosed by the granodiorite and both they and the granodiorite are cut by dikes of various kinds.

The Tertiary lake beds occur chiefly in depressions in the Contact district where they have a known thickness of 400 feet and are mainly composed of volcanic tuff. In places they are tilted, flexed and gently folded. They are Pliocene and belong to the Humboldt formation. In the Jarbidge Mountains are some Pleistocene glacial accumulations.

The ores were deposited in at least two periods, one probably Cretaceous and the other post-Miocene.

The Cretaceous deposits are chiefly auriferous and argentiferous copper ores and occur mainly in the Contact district in the contact zone around

the granodiorite and in fissures. The contact metamorphic deposits contain axinite indicating deposition under pneumatolitic conditions. The fissure deposits are associated with the dikes and with contemporaneous or later quartz veins. They occur principally in the granodiorite.

The post-Miocene deposits are argentiferous gold ores. They occur in quartz-adularia veins in the older rhyolite of the Jarbidge district. The fissures are comprised mostly in two main systems which converge downward. The present gangue minerals were deposited by ascending thermal solutions that dissolved and replaced an older calcite gangue.

F. C. S.

GEOLOGY.—*Geology and mineral resources of the Peoria quadrangle.* J. A. UDDEN. Bulletin, U. S. Geological Survey No. 506. Pp. 103, with maps, sections and views.

The Peoria 30 minute quadrangle, in north-central Illinois, is located along the Illinois River and on the northwestward rise of the eastern interior coalfield, tho it is far within the border of the latter. The stratigraphy and economic geology are accordingly largely concerned with the Pennsylvanian coal measures and coals, the latter of Allegheny age being easy of access. Special attention is given to the overthrusts and faults exposed in the mines of the region and to the origin of the "white top" while some places overlies coal No. 6. The thrusts of the softer beds of the "coal measures" which are not very deeply buried, are attributed by Udden to the pressure and motion of a continental ice sheet in Pleistocene time. Considerable very interesting evidence is adduced in support of this view. The "white top," a mixture of shale, sand and limestone in a chalk-like groundmass, is conclusively explained as residual and inwashed material occupying solution channels cut in the base of the limestone which overlies the coal.

Other notable features of the bulletin are the discussion of the pre-Quaternary topography and the interpretation of the deep well records.

DAVID WHITE.

BOTANY.—*The grasses and grass-like plants of New Mexico.* E. O. WOOTON and PAUL C. STANDLEY. New Mexico Agricultural Experiment Station Bulletin, **81**: 1–175, with numerous illustrations. 1912.

The introduction contains a discussion of life zones and grass societies in New Mexico, with maps illustrating each. Five grass societies are

outlined, (1) the blue grama (*Boutéloua oligostachya*), the most important, occupying the higher plains and much of the mountains; (2) the black grama (*Bouteloua eriopoda*) society, characteristic of the less elevated plains in the southern part of the State; (3) a society intermediate between nos. 1 and 2, best developed in the southeast corner of New Mexico; (4) the salt-grass (*Distichlis spicata*) society, characteristic of moist alkaline soils; and (5) the Arizona fescue (*Festuca arizonica*) society, confined to open parks in the higher mountains. The body of the work consists of an annotated list of the Poaceae, Cyperaceae, and Juncaceae of the State, with notes upon their economic importance. Keys are furnished for the identification of the genera and species.

P. C. S.

BOTANY.—*Three new club-mosses from Panama*, WILLIAM R. MAXON. Smithsonian Miscellaneous Collection, **56**: no. 29, with 3 plates. January 6, 1912.

Lycopodium foliaceum, *L. stamineum*, and *L. watsonianum* are described, each being illustrated. All are from the humid forests of the Province of Chiriqui, Republic of Panama. P. C. STANDLEY.

FORESTRY.—*Lightning in relation to forest fires.* FRED G. PLUMMER. Forest Service Bulletin 111. Pp. 41, with plates and diagrams. 1912.

Careful observations on the national forests have shown that lightning ranks second only to sparks from locomotives as a source of conflagration. From early times there has been a belief that certain trees are more likely to be struck than others. Experiments made, both in Europe by Du Moncel and in the United States by the Forest Service, show, however, that no kind of tree is exempt. Laboratory experiments prove that the electric conductivity of wood depends upon its water content. The moisture content of the wood in a tree is subject to great changes. Rain can so wet any tree that it will become, for the time being, an excellent conductor. Thus, tho the moisture content of wood, particularly within the outermost layer of growth in the living tree, favors conduction even the most resinous of trees, with the lowest moisture content, can in a heavy rain become good conductors in a moment's time.

Trees are the objects most often struck by lightning, because (a) they are numerous; (b) they extend upward and shorten the distance to a cloud, and (c) their spreading branches and roots present an ideal

form for conducting an electrical discharge to the earth. The greatest number of trees struck in any locality will be of the dominant species. The likelihood of a tree being struck is increased (a) if it is taller than surrounding trees, (b) if it is isolated, (c) if it is upon high ground, (d) if it is deeply rooted, (e) if it is the best conductor at the moment of the flash.

Only about 2 per cent of the trees struck by lightning on the national forests are ignited. While in general one species may be more inflammable than another, the degree of inflammability varies with the locality and season. The tree most often struck and ignited in the west is the yellow pine, which grows in open, park-like stands, where the fire hazard is small. It is probable that most forest fires caused by lightning are due to the presence of dry humus or litter at the base of the tree. There is a possibility that some forest fires are started by lightning striking the ground and igniting the soil cover. FINDLEY BURNS.

FORESTRY.—*Emory oak in southern Arizona.* FRANK J. PHILLIPS. Forest Service Circular 201. Pp. 15, with plates. 1912.

Emory oak (*Quercus emoryi*) forms one of the most important types in the open woodland forest of the southwest, and is the most common oak in the mountains of southern New Mexico and Arizona. It affords protection to watersheds, and has high value for fuel in a region where wood is scarce. Also, there is a possibility that its bark may become a source of tannic acid.

The emory oak ranges from western Texas to the western slopes of the Pajarito Mountains, Arizona, and from the south-central portion of Arizona to the south-central part of the Province of Chihuahua, Mexico. It is able to grow on a variety of sites, though it does best on deep alluvial soils with abundant water. The tree varies in form and size and in character of stand more than any other oak in its range. In broad, open valleys the tree reaches its maximum development, with breast-high diameters of from 2 to 3 feet and a total height of from 60 to 70 feet.

Altho emory oak produces seed abundantly, and much of this seed germinates to furnish the original seedlings from which subsequent sprouts develop, reproduction is due almost entirely to sprout growth. As with other broadleaf trees, the season of cutting has a marked influence on the sprouting capacity of the stump, and summer cutting is most likely to result in the death of the stump.

For the proper management of emory oak it is only necessary to keep

fire out and to prohibit cutting from July to September, and especially in August. The best results in securing coppice growth will accrue from a system which confines cutting to the period from November to April, inclusive. Clear cutting should never be practiced, and the wasteful pollarding practiced by the Mexican woodchoppers is even preferable, as a sort of rough selection system, to a clear cutting, which tends to lay bare a large area and render all unprotected young growth susceptible to injury. FINDLEY BURNS.

ZOOLOGY.—*Notes on a new species of flatfish from off the coast of New England.* WILLIAM C. KENDALL. Bulletin of the U. S. Bureau of Fisheries, vol. 30, 1910, pp. 389–394, pl. lvii. Issued August 13, 1912.

About April 18, 1912, the Bureau of Fisheries received from Mr. John R. Neal, of Boston, three specimens of flounders taken in an otter trawl on one of the offshore banks of New England. An examination of these specimens and comparison with known American and European flatfish indicated that they are a hitherto undescribed species. Later, additional specimens were received from Mr. Neal, by request, and examination supported the view that they were new to science. Dr. Kendall has accordingly published a description of this flounder, naming it *Pseudopleuronectes dignabilis.*

While the differences between this form and *P. americanus* are not very great, they appear to be collectively constant, although many of the characters individually approach *P. americanus* very closely. In fact, some of them, especially those exhibited by single specimens of each form examined, may disappear in an examination of larger series, particularly of fish of similar sizes, as the gillrakers and teeth of most fishes vary in number and character with the age of the fish. All of the differences, even, may be found to intergrade, but on the principle that a binomial name should represent what is known rather than what is not, it is believed that what is shown in the description entitles this fish to be considered a distinct species until complete intergradation shall have been proved. Should such an intergradation be discovered, the name will only be lengthened to a trinomial.

The most conspicuous differential characteristics of this species consist of a somewhat shorter head, a larger number of vertical fin rays, the coloration, and the large size attained; which, taken with its deep-water habitat and different spawning season from that of *P. americanus*, seem sufficiently distinctive.

Something over fifteen years ago Dr. Kendall was informed by a Georges Bank fisherman that occasionally flounders were taken on Georges Banks that were known to the fishermen as "lemon sole," owing to their prevailing yellow coloration. The identity of this fish was never definitely determined. The U. S. National Museum a number of years ago received from Fulton Market, New York, some large flounders taken in deep water off the New England coast which were then regarded as a deep-water form of *P. americanus*. The fish is thick and firm-meated, the flesh flaky and, when cooked, moist and of delicious flavor. ETHEL M. SMITH.

ZOOLOGY.—*The Bryozoa of the Woods Hole region.* RAYMOND C. OSBURN. Bulletin of the U. S. Bureau of Fisheries, vol. 30, 1910, pp. 203–266, pls. xviii–xxxi. Issued June 25, 1912.

The biological survey of the waters of Woods Hole, Mass., and vicinity, covering the years 1903 to 1909 and to be reported upon in a forthcoming extensive volume of the Bulletin of the Bureau of Fisheries, furnished so much bryozoan material that Dr. Osburn was led to prepare a special systematic discussion of this group. The region embraced in the survey includes Vineyard Sound between a line drawn from East Chop to Falmouth Heights and one from Gay Head to Sow and Pigs Reef, and Buzzards Bay above a line drawn from Sow and Pigs Reef to the Hen and Chickens Lightship.

In consequence of the fact that the Bryozoa of the American Atlantic coast have received comparatively little study, the collections of the recent survey have nearly doubled the number of known species from this region, bringing it up to 81, besides adding a number of varieties which have at times been classed as species. Only 5 of these species, however, are described as new, with 7 others known to occur only within this intermediate region between Florida and Canada. Of characteristic southern species there are almost no representatives. Fully one-half are characteristically northern or even arctic in their range. Another fourth is composed of species which have such wide distribution that they may be called cosmopolitan.

Within the region itself, 28 species found in the outer waters are not represented in the inner waters, and 12 species from the latter areas are not found in the others. This leaves more than one-half of the total number common to both inner and outer waters. Comparatively few of the species show a preference for any special habitat, and the majority

are rather small, though some of the erect chilostomes form bushy colonies several inches in height.

The author calls attention to the fact that while the Bryozoa yield no useful products and thus have no direct value in commerce, they, like most other small marine animals, play a part in furnishing food for fishes. He has seen large nodules of *Schizoporella* and *Smittia* taken from the stomachs of sharks, while among the edible fishes the examination of such species as the cunner and tautog indicates that the various Bryozoa often form no inconsiderable part of the diet.

To this paper is appended a bibliography of 73 titles.

ETHEL M. SMITH.

TECHNOLOGY.—*The preservation of mine timbers.* E. W. PETERS. Forest Service Bulletin 107. Pp. 27, with plates and diagrams. 1912.

In mining operations the cost of timber is a factor of much importance. In 1907, $10,000,000 was spent for round mine props alone, while additional outlay was necessary for lagging, planking, and other forms of lumber extensively used in mines. The life of mine timbers is in many cases very short, and as the supply of the better grades becomes depleted the less durable kinds must be used.

Altho decay, which in general is the agency most destructive to timber used in mines, may be retarded by peeling and seasoning, treatment with a suitable preservative is more effective.

The average life of green, unpeeled, and untreated loblolly pine gangway sets, under the conditions studied, was less than one and one-half years. Brush treatments with creosote and carbolineum increased this to three and four years, while impregnation with zinc chloride and creosote left from 70 to 90 per cent of the timbers sound at the end of four years.

Brush treatments are economical when the amount of timber to be treated will not warrant the erection of a small open-tank or pressure plant, or when only a short increase in service is required. The open-tank process is adapted to the treatment of small quantities of easily impregnated timber. When a large amount of material is to be treated, a pressure process should be used. Mine timbers impregnated with zinc chloride and creosote oils have shown the best results.

FINDLEY BURNS.

PROGRAMS AND ANNOUNCEMENTS

CHEMICAL SOCIETY

The annual election will be held at the 218th regular meeting, to be held at the Cosmos Club, at 8 p.m., Thursday, November 14. The usual smoker will follow the election.

BUREAU OF STANDARDS

The current meetings of the Physics Club of the Bureau of Standards are being devoted to the discussion of the application of the electron theory classes of phenomena. The papers in this series are as follows:

October 14 and 21, *Determinations of* $\frac{e}{m}$ *and of* e, DR. P. G. AGNEW; October 28, *Conduction in gases*, MR. A. MARCUS; November 4, *The Zeeman effect*, MR. L. B. OLMSTEAD; November 11 and 18, *Metallic conduction and thermo-electric effects*, DR. W. P. WHITE, of the Geophysical Laboratory; November 25, *The index of refraction*, MR. E. C. CRITTENDEN; December 2, *Nature and properties of the electron*,————.

For the remaining meetings in December the following papers have been arranged: December 9, *Radiation pressure*, MR. P. D. FOOTE; December 16, *Measurements of wave-length*, MR. I. G. PRIEST.

The later dates are provisional since it is expected that a popular lecture will be given during November, in which case the regular program will be displaced one week.

The meetings are held in the lecture room of the Bureau of Standards from 4.30 to 5.30 and are open to anyone interested. Further information regarding them may be obtained from the secretary, Mr. E. C. Crittenden.

VAULT